STATION 02 Goddard Initiatives

From Atoms to Molecules

Huge interstellar clouds of dust particles and gas can form between the stars. In the cold cores of dense clouds, a rich chemistry develops as atoms combine to form molecules.

Astronomers have identified more than 120 kinds of molecules in such clouds. Simple molecules can be made in space either as a gas or on dust grains, and those simple molecules evolve into even more complicated ones through processes studied by scientists of the Goddard Center for Astrobiology. Most of the atoms in your body are bound up in molecules.

T.A.Rector (NOAO/AURA/NSF) and Hubble Heritage Team (STScI/AURA/NASA)

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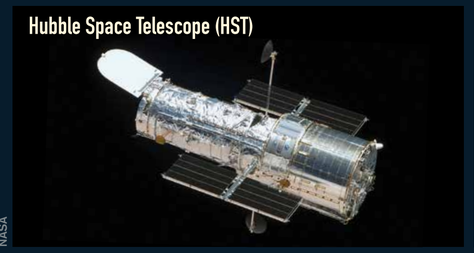
TWO DENSE INTERSTELLAR CLOUDS: The dark object at left is a Bok Globule. At right is the Horsehead Nebula, a cold interstellar region of gas and dust in front of hot clouds of hydrogen atoms (red light). The horsehead is about 4 light years (38,000,000,000,000 kilometers) in size, from top to bottom.

We Study Chemistry in Space

Courtesy W.M. Keck Observatory

ESOC/C. Malin



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Members of the Goddard Center for Astrobiology use sophisticated equipment to study the atoms and molecules in outer space between stars, around stars, on planets and moons, and on comets and asteroids. We identify them by the light they absorb or emit at X-ray, ultraviolet, visual, infrared or radio wavelengths. Our laboratory scientists study how cosmic rays and high-energy light can both make and destroy molecules, including those with biological roles.

DID YOU KNOW?

The calcium in your bones and the iron in your blood were made in stars. Also, some of the molecules made in the cold birth cloud of our Solar System are preserved in comets and carbonaceous meteorites.